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FEDERAL - STATE - PRIVATE  
COOPERATIVE SNOW SURVEYS

U. S. DEPT. OF AGRICULTURE  
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FEB 25 1966

CURRENT SERIAL RECORDS

**WATER SUPPLY OUTLOOK**  
and  
**FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS**  
for  
**MONTANA**

UNITED STATES DEPARTMENT of AGRICULTURE...SOIL CONSERVATION SERVICE,  
and  
MONTANA AGRICULTURAL EXPERIMENT STATION

Data included in this report were obtained by the agencies named above in cooperation with Federal, State, and private organizations listed on the inside back cover of this report.

AS OF  
**FEB. 1, 1966**

# UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

## *To Recipients of Water Supply Outlook Reports:*

Most of the usable water in western states originates as mountain snowfall. This snowfall accumulates during the winter and spring, several months before the snow melts and appears as streamflow. Since the runoff from precipitation as snow is delayed, estimates of snowmelt runoff can be made well in advance of its occurrence. Streamflow forecasts published in this report are based principally on measurement of the water equivalent of the mountain snowpack.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season as they affect runoff will add to be an effective average. Early season forecasts are therefore subject to a greater change than those made on later dates.

The snow course measurement is obtained by sampling snow depth and water equivalent at surveyed and marked locations in mountain areas. A total of about ten samples are taken at each location. The average of these are reported as snow depth and water equivalent. These measurements are repeated in the same location near the same dates each year.

Snow surveys are made monthly or semi-monthly from January 1 through June 1 in most states. There are about 1400 snow courses in Western United States and in the Columbia Basin in British Columbia. In the near future, it is anticipated that automatic snow water equivalent sensing devices along with radio telemetry will provide a continuous record of snow water equivalent at key locations.

Detailed data on snow course and soil moisture measurements are presented in state and local reports. Other data on reservoir storage, summaries of precipitation, current streamflow, and soil moisture conditions at valley elevations are also included. The report for Western United States presents a broad picture of water supply outlook conditions, including selected streamflow forecasts, summary of snow accumulation to date, and storage in larger reservoirs.

Snow survey and soil moisture data for the period of record are published by the Soil Conservation Service by states about every five years. Data for the current year is summarized in a West-wide basic data summary and published about October 1 of each year.

Listed below are water supply outlook reports based on Federal-State-Private Cooperative snow surveys. Those published by the Soil Conservation Service may be obtained from Soil Conservation Service, Room 507, Federal Building, 701 N. W. Glisan, Portland, Oregon 97209.

### PUBLISHED BY SOIL CONSERVATION SERVICE

<u>REPORTS</u>	<u>ISSUED</u>	<u>LOCATION</u>	<u>COOPERATING WITH</u>
<b>RIVER BASINS</b>			
WESTERN UNITED STATES	MONTHLY (FEB.-MAY)	PORTLAND, OREGON	ALL COOPERATORS
BASIC DATA SUMMARY	OCTOBER 1	PORTLAND, OREGON	ALL COOPERATORS
<b>STATES</b>			
ALASKA	MONTHLY (MAR.-MAY)	PALMER, ALASKA	ALASKA S.C.D.
ARIZONA	SEMI-MONTHLY (JAN.15 - APR.1)	PHOENIX, ARIZONA	SALT R. VALLEY WATER USERS ASSOC. ARIZ. AGR. EXP. STATION
COLORADO AND NEW MEXICO	MONTHLY (FEB.-MAY)	FORT COLLINS, COLORADO	COLO. STATE UNIVERSITY COLO. STATE ENGINEER N. MEX. STATE ENGINEER
IDAHO	MONTHLY (JAN.-JUNE)	BOISE, IDAHO	IDAHO STATE RECLAMATION ENGINEER
MONTANA	MONTHLY (JAN.-JUNE)	BOZEMAN, MONTANA	MONT. AGR. EXP. STATION
NEVADA	MONTHLY (JAN.-MAY)	RENO, NEVADA	NEVADA DEPT. OF CONSERVATION AND NATURAL RESOURCES - DIVISION OF WATER RESOURCES
OREGON	MONTHLY (JAN.-JUNE)	PORTLAND, OREGON	OREG. STATE UNIVERSITY OREGON STATE ENGINEER
UTAH	MONTHLY (JAN.-JUNE)	SALT LAKE CITY, UTAH	UTAH STATE ENGINEER
WASHINGTON	MONTHLY (FEB.-JUNE)	SPOKANE, WASHINGTON	WN. STATE DEPT. OF CONSERVATION
WYOMING	MONTHLY (FEB.-JUNE)	CASPER, WYOMING	WYOMING STATE ENGINEER

### PUBLISHED BY OTHER AGENCIES

<u>REPORTS</u>	<u>ISSUED</u>	<u>AGENCY</u>
BRITISH COLUMBIA	MONTHLY (FEB.-JUNE)	WATER RESOURCES SERVICE, DEPT. OF LANDS, FOREST AND WATER RESOURCES, PARLIAMENT BLDG., VICTORIA, B.C., CANADA
CALIFORNIA	MONTHLY (FEB.-MAY)	CALIF. DEPT. OF WATER RESOURCES, P.O. BOX 388, SACRAMENTO, CALIF.

WATER SUPPLY OUTLOOK  
FEDERAL-STATE-PRIVATE COOPERATIVE SNOW SURVEYS  
for  
MONTANA

Report Prepared

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MONTANA  
WATER SUPPLY OUTLOOK  
as of  
February 1, 1966

\* \* \* \* \*  
\* Late season water supply is expected to be \*  
\* critical on streams not having reservoir \*  
\* storage in the westcentral and southwest \*  
\* portions of the state. Snow accumulation \*  
\* varies across the state from near average \*  
\* in the northwest to 65-70 percent average \*  
\* in the southwest. Some smaller areas are \*  
\* nearer 50 percent average. \*  
\* \*  
\* Streamflow is expected to be near average \*  
\* on the Kootenai, decreasing precentage wise \*  
\* to the south where streamflow may obtain \*  
\* the low levels reached in 1961. \*  
\* \* \* \* \*

Snow survey measurements near February 1 indicate the snow pack is about 15 percent above average on the Kootenai River headwaters in British Columbia. The Flathead River drainage has a snow pack about 90 percent average while the Clark Fork has about 80 percent average. Only two courses are measured in the Bitterroot and they indicate about 60 percent of average accumulation to date.

East of the divide the snow pack is presently 75 to 80 percent average on the Jefferson, Madison and Yellowstone River drainages. The Gallatin drainage is near 65 percent average while snow courses west of Helena near the Continental Divide register about 50 percent average for this date.

Streamflow for the April through September period is expected to be near average on the Kootenai River, a little below average on the Flathead River and 70 to 80 percent average in the Clark Fork drainage.

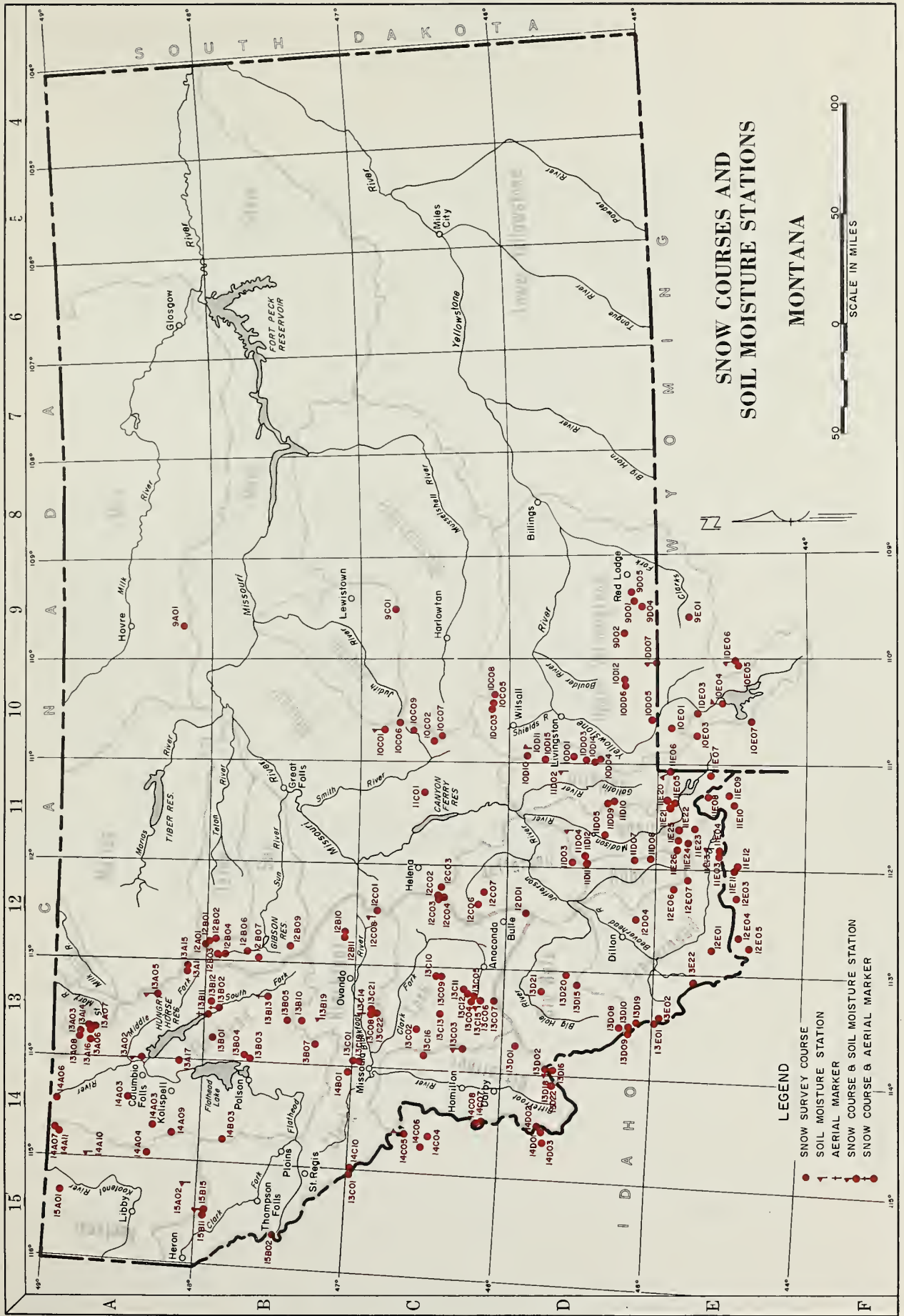
Flows in the Jefferson, Madison and Gallatin Rivers and on streams tributary to the Missouri above Great Falls are anticipated to be near or below the low volumes recorded in 1961. Even if precipitation is above average for the remainder of the snow accumulation period, late season water supplies will be below average in these areas. No shortages are expected on streams with reservoir storage.

Storage in irrigation reservoirs is generally above average and with proper regulation, all reservoirs are expected to fill.

Water contained in the soil under the snow pack is generally above average.

Snow pillow data for Lick Creek for 1964 and 1965 seasons are included in this report along with the 1966 season to date for the four snow pillows presently in operation.



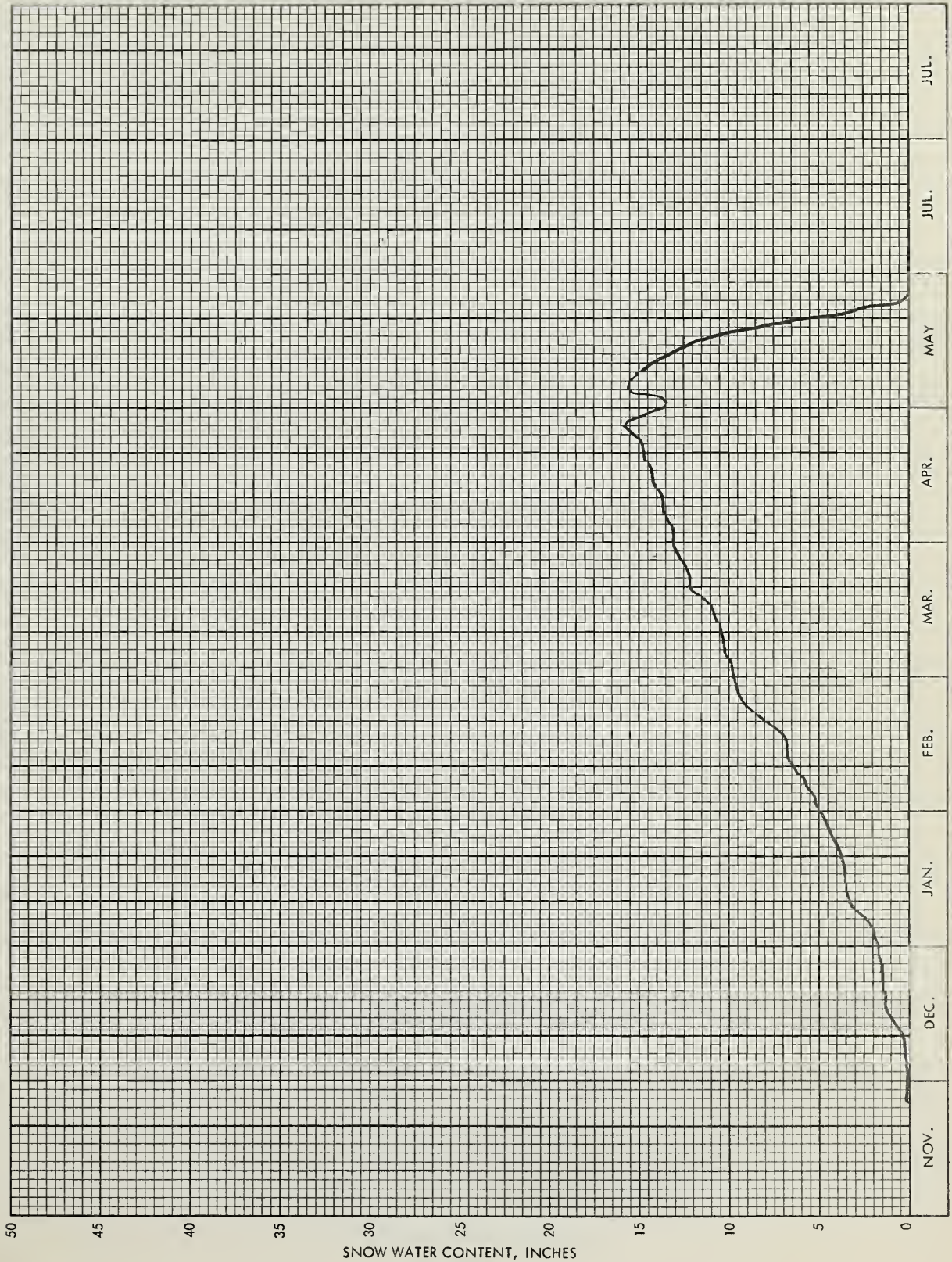




LICK CREEK  
SNOW PILLOW DATA  
1964

AS OF \_\_\_\_\_

Sec. 10 T. 4S R. 6E No. 10D13 Drainage: Missouri  
Lot. 45-30 Long. 111-58 Elev. 6860 Gallatin

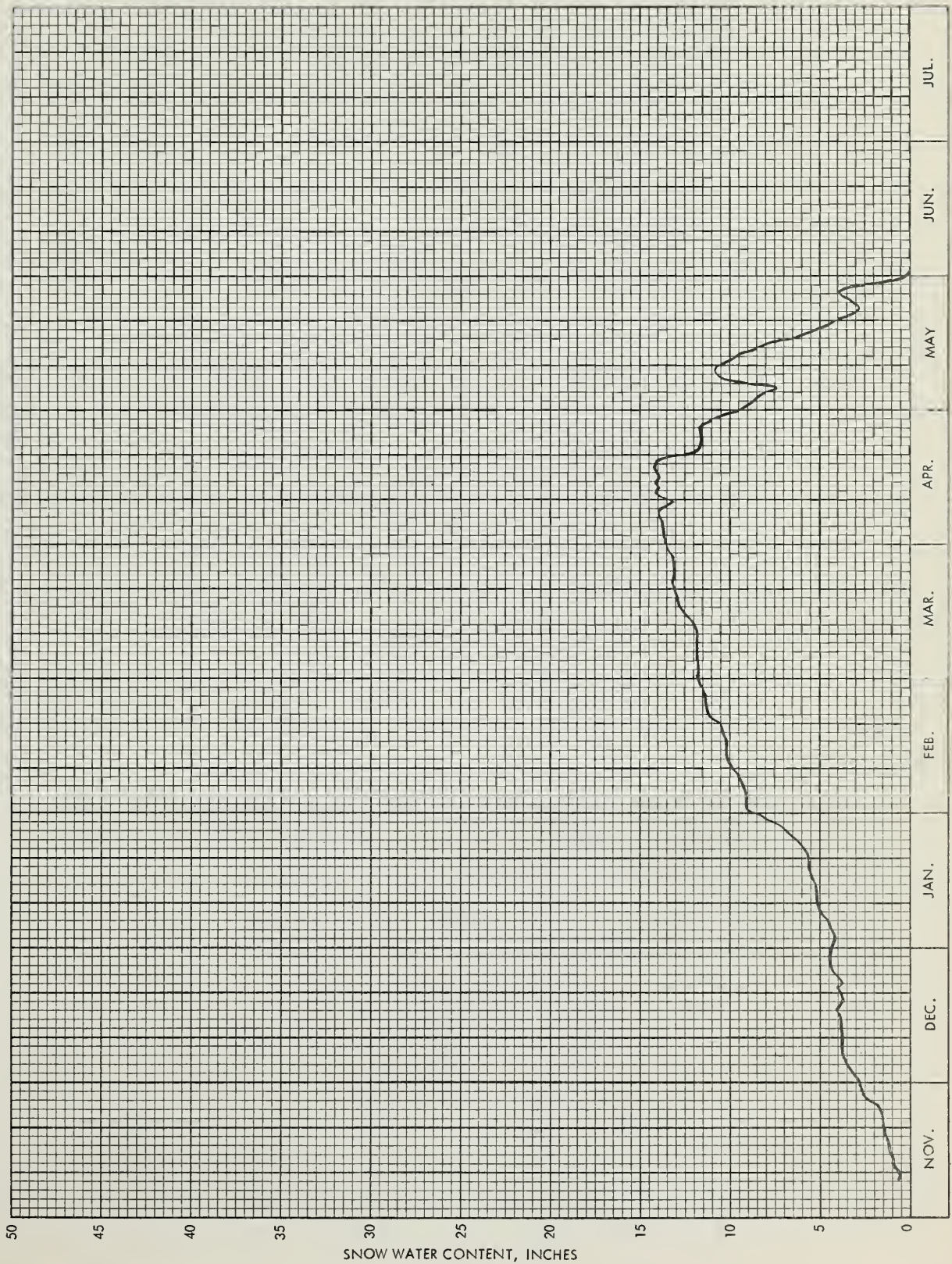




LICK CREEK  
SNOW PILLOW DATA

AS OF 1965

Sec. 10 T. 4S R. 6E No. 10D13 Drainage: Missouri  
Lat. 45-30 Long. 110-58 Elev. 6860 Gallatin



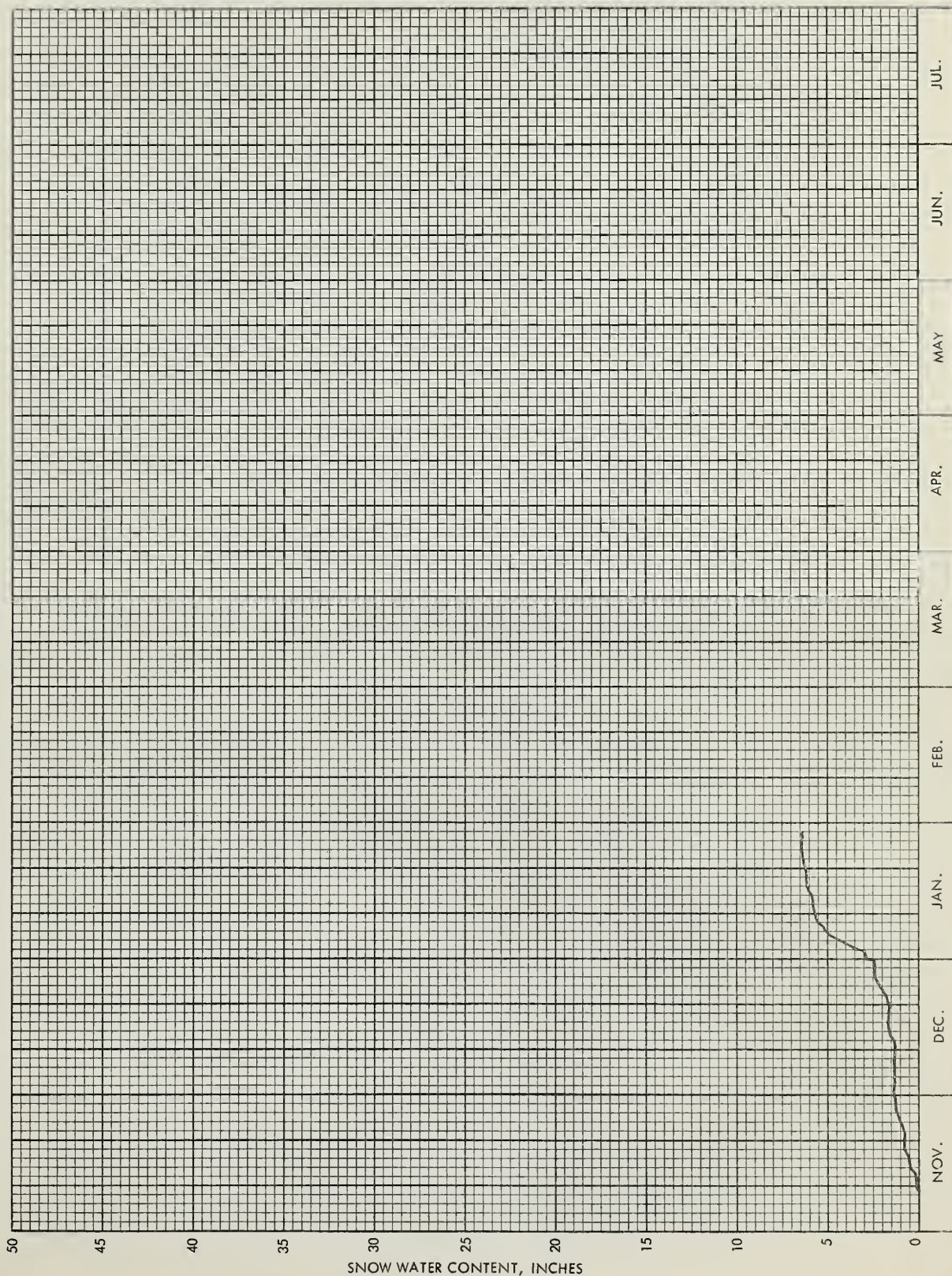
SNOW WATER CONTENT, INCHES



BLACK PINE  
SNOW PILLOW DATA

AS OF FEBRUARY 1, 1966

Sec. 26 T. 8N R. 15W No. 13C13 Drainage: Columbia  
Lat. 46-25 Long. 113-26 Elev. 7100 Clark Fork

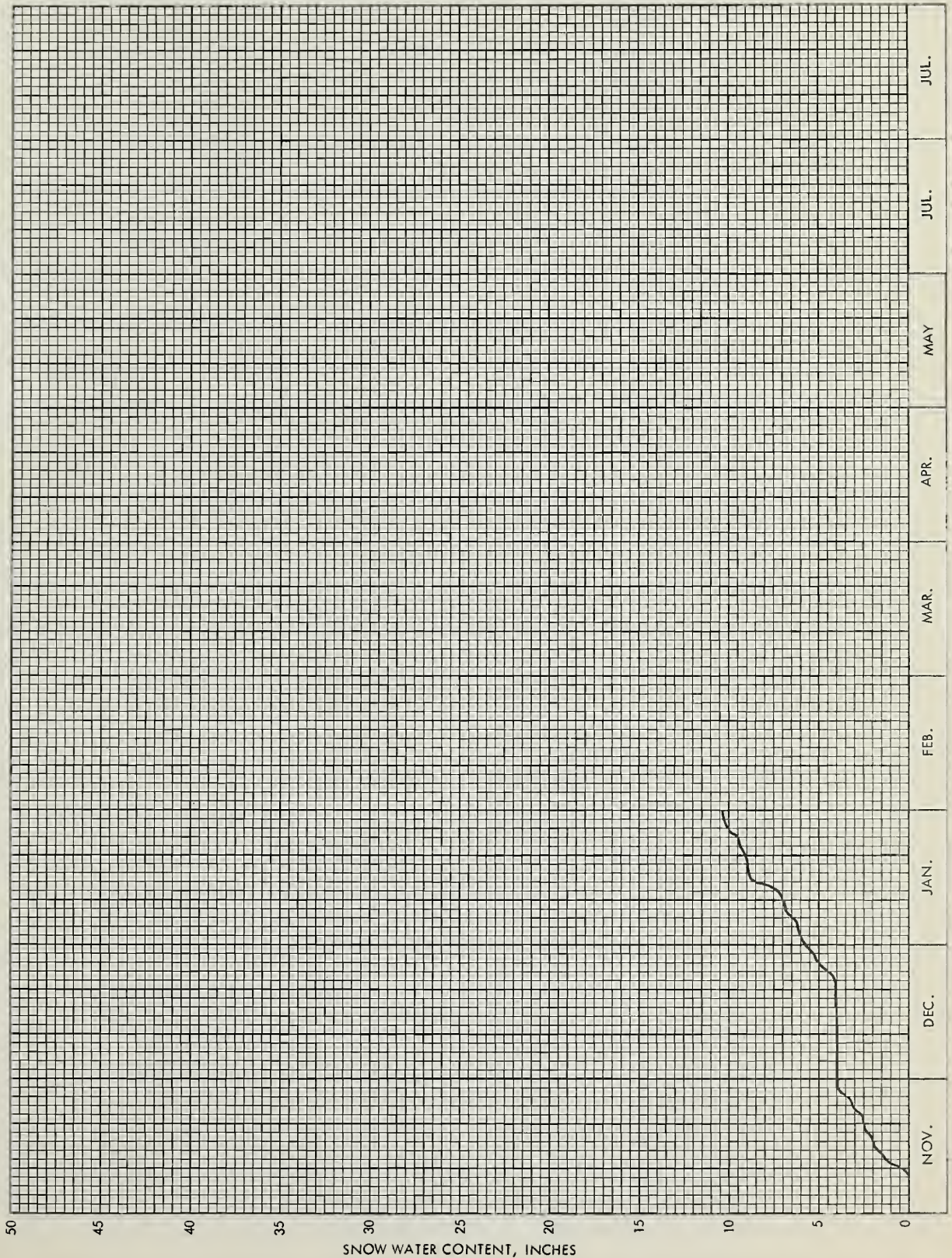




BRIDGER BOWL  
SNOW PILLOW DATA

AS OF FEBRUARY 1, 1966

Sec. 25 T. 1N R. 6E No. 10D15 Drainage: Missouri  
Lat. 45-48 Long. 110-55 Elev. 7250 Gallatin



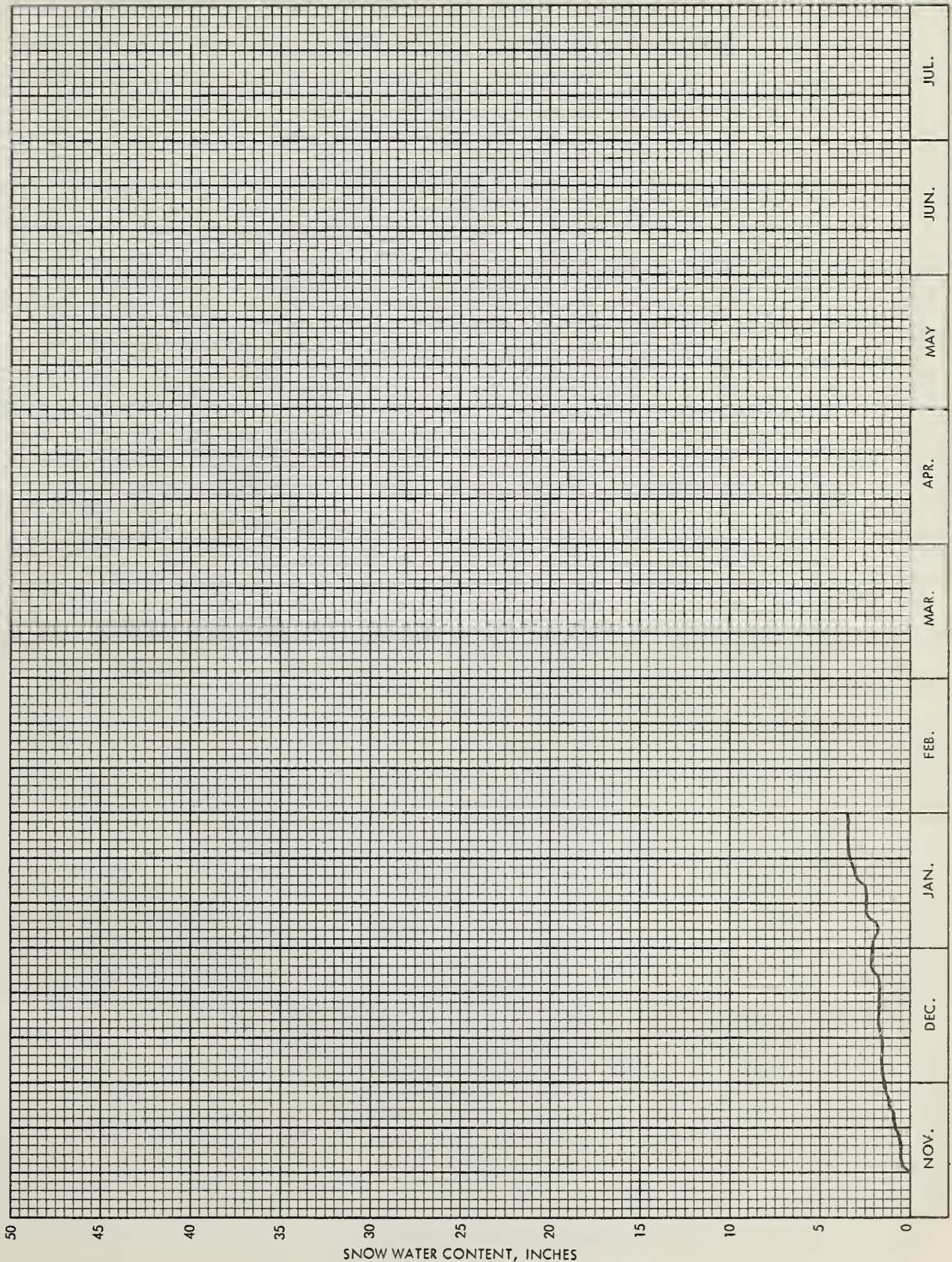


LICK CREEK  
SNOW PILLOW DATA

AS OF FEBRUARY 1, 1966

Sec. 10 T. 4S R. 6E No. 10D13 Drainage: Missouri

Lat. 45-30 Long. 110-58 Elev. 6860 Gallatin



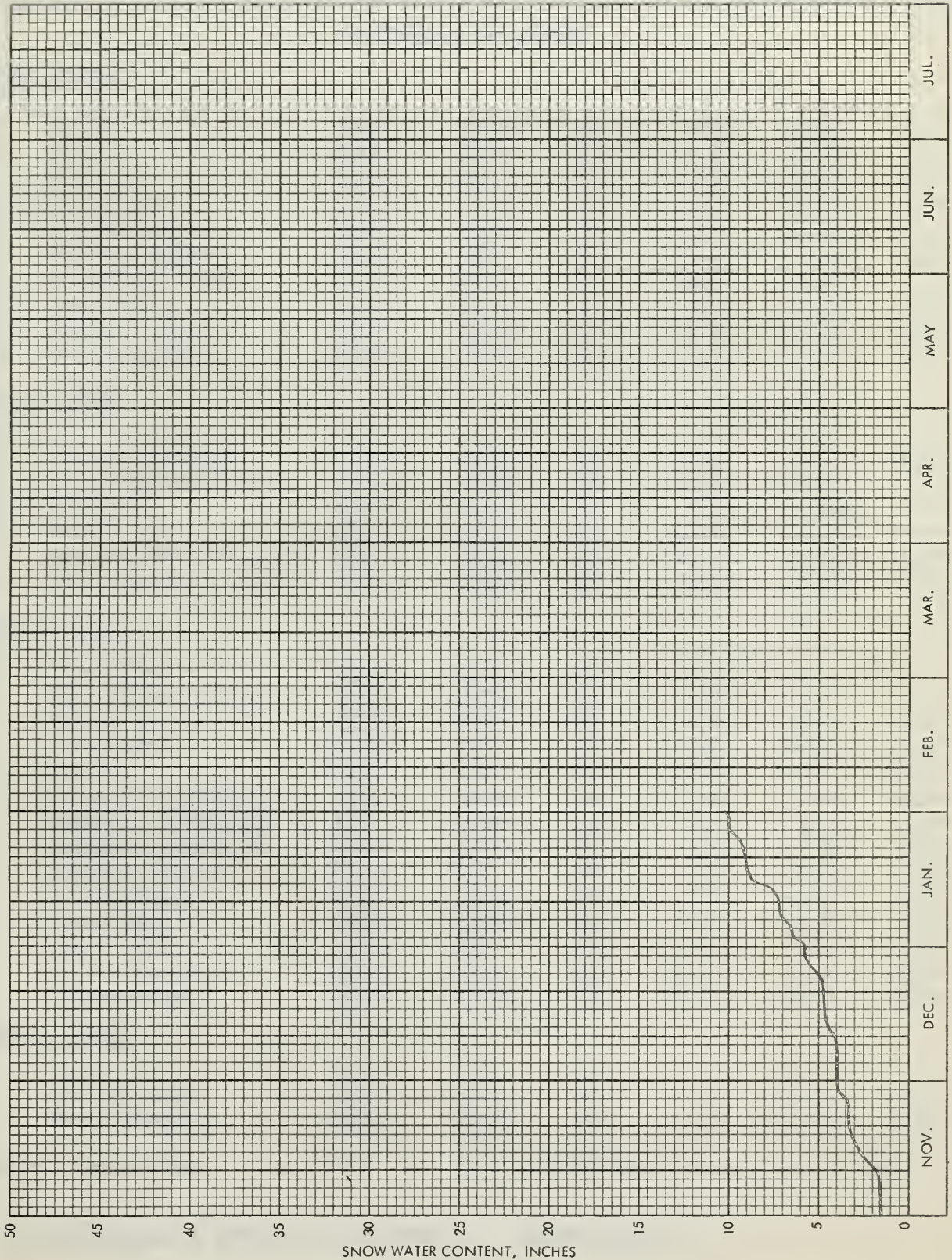
SNOW WATER CONTENT, INCHES



SHOWER FALLS  
SNOW PILLOW DATA

AS OF FEBRUARY 1, 1966

Sec. 14 T. 5S R. 6E No. 10D16 Drainage: Missouri  
Lat. 45-24 Long. 110-57 Elev. 8100 Gallatin





# SNOW SURVEY DATA

AS OF FEBRUARY 1, 1966

(Inches)

SNOW COURSE			CURRENT DATA			PAST RECORD	
NO.	NAME	ELEVATION	DATE OF SURVEY	SNOW DEPTH	WATER CONTENT	WATER CONTENT	
						LAST YEAR	AVERAGE

## COLUMBIA RIVER BASIN

### KOOTENAI RIVER

BC 10	Fernie	3500	1/31	42	9.1	11.6	7.3
BC 12A	Field	4200	1/29	31	6.4	6.9	5.1
BC 11	Glacier	4100	2/1	81	22.2	15.1	19.6
BC 43	Gray Creek	5100	1/30	52	11.9	13.7	12.6*
BC 33	Kicking Horse	5400	1/31	54	13.0	10.7	10.8
BC 32	Marble Canyon	5000	1/31	57	13.2	9.6	11.1
BC 10B	Morrissey Ridge	6100	2/1	75	24.4	22.4	-
BC 10A	New Fernie	4100	1/31	57	14.1	14.3	10.8*
BC 8A	Sinclair Pass	4500	1/31	25	5.3	4.4	4.6*
BC 20A	Sullivan Mine	5100	1/28	40	10.5	10.8	9.5

### FLATHEAD RIVER

13A02	Desert Mountain	5600	1/31	36	10.0	16.2	10.8*
14A03	Hell Roaring Divide	5770	1/28	66	18.2	28.5	-
13B13	Holbrook	4530	1/30	23	6.0A	9.8A	7.7*
13A05	Marias Pass	5250	1/27	47	13.0	15.3	12.9
13B02	Spotted Bear Mountain	7000	1/30	36	10.2A	13.0A	11.2*
13B11	Twin Creeks	3580	1/30	33	8.6*	11.6A	9.8*

### CLARK FORK RIVER

13C13	Black Pine	7100	1/27	26	6.8	-	-
13C13	Black Pine Pillow	7100	1/27	SP	6.5	-	-
13B10	Coyote Hill	4200	2/1	25	6.2	10.2	7.8*
13C04	Intergaard	6450	2/1	19	4.0	8.4	5.4
15B02	Lookout	5250	1/31	71	21.6	27.7	26.4
13C21	Lubrecht Forest No. 3	5450	1/29	20	4.6	7.0	5.8*
13C22	Lubrecht Forest No. 4	4650	1/29	12	2.2	4.6	2.9*
13C08	Lubrecht Forest No. 6	4040	1/29	13	2.4	4.8	3.6*
13C05	Southern Cross	6500	2/1	16	3.1	6.6	4.3
13C18	Spring Gulch	6000	1/30	35	8.1	14.0	8.8*
13C07	Storm Lake	7780	1/28	21	5.0	12.9	8.9*
13C06	Stuart Mill	6500	2/1	17	3.4	6.4	4.4
13C01	Stuart Mountain	7400	1/30	58	15.1	31.4	21.9*
14B01	TV Mountain	6800	1/28	40	11.2	15.9	11.7*

### BITTERROOT RIVER

13D02	Gibbons Pass	7100	1/31	36	9.4	23.8	15.7*
13D16	Moose Creek	6200	1/28	26	5.8	17.0	11.4*

A - Aerial observation - w. c. est. SP - Snow pillow observation - w. c. only.

NOTE: ALL AVERAGES BASED ON 1948-1962 (15 YEAR PERIOD). \*ADJUSTED AVERAGE



# SNOW SURVEY DATA

AS OF FEBRUARY 1, 1966

(Inches)

SNOW COURSE			CURRENT DATA			PAST RECORD	
NO.	NAME	ELEVATION	DATE OF SURVEY	SNOW DEPTH	WATER CONTENT	WATER CONTENT	
						LAST YEAR	AVERAGE

## MISSOURI RIVER BASIN

### BEAVERHEAD RIVER

12E03	Camp Creek	6800	1/28	24	5.6	13.3	6.5
12D04	Carter Creek	7400	1/31	12	2.2	4.5	-
11E12	Kilgore	6200	1/28	25	5.8	10.6	6.4

### JEFFERSON RIVER

12C06	Picnic Grounds	6500	2/1	11	1.7	3.3	3.3
12D01	Pipestone Pass	7200	1/27	12	2.0	3.4	3.3*

### MADISON RIVER

11E09	Big Springs	6500	1/28	41	10.5	22.2	13.7
11E05	Hebgen Dam	6550	1/31	19	4.1	12.6	8.1
11E10	Island Park	6315	1/28	36	8.4	19.4	10.8
10E02	Norris Basin	7500	1/28	24	5.8	11.5	6.9*
11E08	Valley View	6500	1/28	34	8.4	23.5	9.6
11E07	West Yellowstone	6700	1/31	22	5.8	13.4	7.8

### GALLATIN RIVER

10D14	Arch Falls	7350	1/29	18	4.2	11.0	7.3*
10D15	Bridger Bowl Pillow	7250	1/31	SP	10.3	-	-
10D04	Devil's Slide	8100	1/29	30	7.2	21.8	12.7*
10D03	Hood Meadow	6600	1/29	14	3.0	8.4	5.5*
10D13	Lick Creek Pillow	6860	1/31	SP	3.5	-	-
10D01	New World	6700	1/31	19	4.1	7.7	6.6
10D16	Shower Falls Pillow	8100	1/31	SP	10.3	-	-
11E06	Twenty-One Mile	7150	1/31	37	10.4	23.1	12.1

### MISSOURI RIVER (Main Stem)

12C05	Chessman Reservoir	6200	2/1	8	1.3	3.1	3.1
12C02	Ten Mile Lower	6600	2/1	13	2.3	6.2	4.9
13C03	Ten Mile Middle	6800	1/31	20	4.3	9.8	7.3
12C04	Ten Mile Upper	8000	1/31	23	5.0	13.3	9.1

### UPPER YELLOWSTONE RIVER

10E03	Canyon	7750	1/30	31	7.7	21.7	9.4
10E06	East Entrance	7000	1/28	28	5.7	10.4	7.9*
9D05	Grizzly Peak	8400	1/31	23	6.4	9.8	7.1*
10E04	Lake Camp	7850	1/31	24	4.0	10.9	6.5*
9E01	Lodgepole	8200	2/2	21	4.6	10.0	6.6*
10E01	Lupine Creek	7300	1/30	23	5.7	10.4	7.3
10D07	Northeast Entrance	7400	1/31	17	3.8	10.4	5.8
10E05	Sylvan Pass	7100	1/29	28	7.7	16.0	9.3*
10E07	Thumb Divide	7900	1/27	48	15.4	27.3	14.4*

A - Aerial observation - w. c. est. SP - Snow pillow observation - w. c. only.

NOTE: ALL AVERAGES BASED ON 1948-1962 (15 YEAR PERIOD). \*ADJUSTED AVERAGE



# SOIL MOISTURE DATA

AS OF FEBRUARY 1, 1966

(Inches)

SOIL MOISTURE STATION			SOIL PROFILE		CURRENT DATA		PAST RECORD	
NO.	NAME	ELEVATION	DEPTH	FIELD CAPACITY	DATE OF SURVEY	SOIL MOISTURE	LAST YEAR	**AVERAGE

## COLUMBIA RIVER BASIN

### Kootenai

15B15M	Baree Trail	3800	48	7.5	-	-	-	-
14A10M	Murphy Lake R.S.	3000	48	22.6	2/1	19.9	19.6	-
15A02M	Raven R.S.	3050	48	23.0	2/2	20.7	22.0	-

### Flathead

13A02M	Desert Mountain	5600	54	8.4	1/31	7.2	7.1	6.8
13A05M	Marias Pass	5250	54	6.5			5.5	5.0

### Clark Fork

13C13M	Black Pine	7100	48	10.0	1/27	4.9	-	-
13C15M	Georgetown Lake	6450	48	9.0	1/27	3.7	2.6	2.7
13B19M	Seeley Lake R.S.	4030	48	11.9	2/2	10.0	7.5	-
13C03M	Skalkaho Summit	7260	48	10.8	-	-	-	-

### Bitterroot

13D18M	Gibbons Pass	7100	48	7.1	1/31	5.0	5.5	5.6
14C05M	Lolo Pass	5250	48	10.6	1/30	6.3	7.7	-

## MISSOURI RIVER BASIN

### Beaverhead

11E13M	Lakeview	6700	48	15.3	1/31	6.0	11.2	8.3
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### Madison

10D04M	Red Bluff	4800	40	4.7			2.3	2.1
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### Gallatin

10D15M	Bridger Bowl	7250	48	15.8	2/1	15.1	-	-
11D02M	College Site	4856	54	14.5	1/28	13.5	10.0	8.9
10D13M	Lick Creek	6860	48	18.8	-	-	-	-
11E06M	Twenty-One Mile	7150	48	10.0	1/30	3.1	1.5	-

### Missouri Main Stem

10C01M	Kings Hill	7420	48	11.8	1/25	9.0	7.8	-
12C08M	Stemple Pass	6350	48	5.9	1/31	4.4	4.2	-

### Yellowstone

10D11M	Battle Ridge	6020	48	17.6	2/1	12.7	15.3	12.6
10D07M	Northeast Entrance	7350	48	9.4	1/31	7.7	5.8	7.0

\*\*AVERAGE FOR PERIOD OF RECORD

# LEAD STUDY

DATE: \_\_\_\_\_

NAME: \_\_\_\_\_

DATE	TIME	LOCATION	ACTIVITY	REMARKS
10/10/20	10:00	10:00	10:00	10:00
10/10/20	10:00	10:00	10:00	10:00
10/10/20	10:00	10:00	10:00	10:00
10/10/20	10:00	10:00	10:00	10:00

DATE	TIME	LOCATION	ACTIVITY	REMARKS
10/10/20	10:00	10:00	10:00	10:00
10/10/20	10:00	10:00	10:00	10:00
10/10/20	10:00	10:00	10:00	10:00
10/10/20	10:00	10:00	10:00	10:00

# RESERVOIR STORAGE DATA

AS OF JANUARY 31, 1966

(1000 Acre Feet)

			USEABLE STORAGE		
BASIN	RESERVOIR	USEABLE CAPACITY	THIS YEAR	LAST YEAR	AVERAGE
COLUMBIA RIVER BASIN					
Flathead	Hungry Horse	3,428.0	2,381.0	2,811.0	2,693.4**
	Flathead Lake	1,791.0	1,418.0	1,384.0	1,042.9
	Camas (Sum of 4)	45.2	27.3	18.8	30.4
	Mission Valley (Sum of 8)	100.3	57.2	36.5	31.9
Clark Fork	Georgetown Lake	31.0	28.7	29.6	24.5
Bitterroot	Noxon Rapids	334.6	324.5	331.0	-
	Como	34.9	13.1	12.0	10.8
	Painted Rocks	31.7		-	14.0**
MISSOURI RIVER BASIN					
Beaverhead	Clark Canyon	328.9	151.2	66.3	-
	Lima	84.0	45.1	-	26.0
Ruby	Ruby	38.8		-	18.4**
Madison	Hebgen Lake	377.5	222.3	220.8	180.4
	Ennis Lake	41.0	39.9	37.1	36.8
Gallatin	Middle Creek	8.0	1.4	3.7	3.3**
Missouri	Canyon Ferry	2,043.0	1,568.0	1,831.0	1,553.9**
	Hauser & Helena	61.9	60.7	59.6	51.6
	Lake Helena	10.4	10.0	9.6	7.2
	Holter Lake	81.9	81.0	63.5	59.6
	Smith River	10.7	7.9	8.5	5.2**
	Ackley Lake	5.8		-	3.6
	Durand	7.0	5.9	5.5	3.9**
	Martinsdale	23.1	12.1	7.6	8.4**
	Deadman's Basin	72.2	66.2	43.0	39.5**
	Fort Peck	19,410.0	17,000.0	15,290.0	10,575.1
Sun	Gibson	105.0	55.5	46.2	55.7
	Willow Creek	32.3	23.8	15.6	19.2
	Pishkun	32.0	18.8	17.4	18.7
Marias	Lower Two Medicine			-	0.0
	Four Horns	19.2	12.3	-	10.4
	Swift			-	19.9
	Lake Frances	112.0	94.2	-	91.7
	Tiber	1,347.0	672.3	678.3	628.0**
Milk	Fresno	127.2	85.1	64.4	59.4
	Nelson	66.8	51.0	36.7	36.7
	Lake Sherburne	66.1	11.3	-	18.4
Yellowstone	Mystic Lake	20.8	12.8	11.8	10.6
	Tongue River	68.0		-	11.2
	Cooney	27.5	17.3	14.5	10.8**
Big Horn	Boysen	757.8	345.9	326.5	417.4
	Buffalo Bill	421.3	283.9	174.4	216.6
	Bull Lake	152.0	106.5	85.6	68.4
	Yellowtail	1,409.0	146.2	-	-



## Agencies Cooperating in Collecting Data Contained in this Bulletin

U. S. Forest Service  
Region 1, Missoula, Montana

U. S. Geological Survey  
Helena, Montana

U. S. Army Corps of Engineers  
Portland, Oregon  
Seattle, Washington  
Omaha, Nebraska

U. S. Indian Irrigation Service  
St. Ignatius, Montana

U. S. Weather Bureau  
Helena, Montana

U. S. Bureau of Sports Fisheries  
and Wildlife  
Red Rock Lakes Refuge  
Monida, Montana

U. S. Bureau of Reclamation  
Billings, Montana  
Boise, Idaho

U. S. Soil Conservation Service  
Montana, Wyoming, Idaho

Soil and Water Conservation Districts  
Montana Counties

U. S. Bonneville Power Administration  
Portland, Oregon

U. S. National Park Service  
Yellowstone National Park  
Glacier National Park

Montana Power Company  
Butte, Montana

State Water Conservation Board  
Helena, Montana

North Montana Branch Station  
Agricultural Experiment Station  
Havre, Montana

Montana State University  
Agricultural Experiment Station  
Bozeman, Montana

University of Montana  
School of Forestry  
Missoula, Montana

Johnson Flying Service, Inc.  
Missoula, Montana

Water Rights Branch, Dept. of  
Lands and Forests  
Victoria, British Columbia

Department of Northern Affairs  
and National Resources  
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